



CONTENTS

Problem	2
Supporting research and evidence ..	2
What are the countermeasures?	
Safe Roads and Roadsides	2
Metropolitan Intersection Crash Program	3
Black spot program	3
Regional Intersection Active Warning Systems	4
Vulnerable Road Users at Intersections	4
Safe Speed	4
Safe Road User Behaviour	5
What is the future focus?	6
References	7

ROAD SAFETY STRATEGY

In 2008, the State Government released its 12-year road safety strategy, *Towards Zero*. *Towards Zero* set out the ambitious target of 11,000 fewer people killed or seriously injured (KSI) by 2020, which is a 40% reduction from the baseline period of 2005–2007.

The baseline figure for KSI in intersection crashes was 1282. Using a 40% reduction, a figure of 769 is the government’s target for 2020.

One key aspect of safer roads is preventing crashes where vehicles collide at intersections, a crash type particularly common in urban areas. This includes single vehicle crashes, multi-vehicle crashes and crashes where pedestrians, cyclists or other vulnerable road users were hit while crossing the intersection.

PROBLEM

The estimated figure of WA intersection KSI for 2016 was 890. This number exceeds the 2020 KSI reduction target (n=769) by 121.

A six-year period 2010-15 recorded 191 (avg. = 32) fatalities at intersections in WA. In 2015, 15% of the total number of fatalities (n=161) was recorded for intersection crashes (RSC 2015).

Intersection crashes account for approximately 20% of fatalities in Australia, the majority of deaths occurring at urban intersections. In 2016, 206 people were killed at urban intersections in Australia (NRSAP 2018).

Between 2013 and 2017 49% of all KSI crashes in metropolitan areas occurred at intersections. Over the same period 19% of KSI crashes in regional areas occurred at intersections.

Crashes at intersections can also involve pedestrians, cyclists and motorcyclists. A 2013 review found that about 2% of the intersection crashes in the Perth central business district reported to the Police involved a collision with one or more pedestrians (Palamara, 2013). Younger and older people were more frequently involved in pedestrian crashes, and more male than female pedestrians were killed.

About six in ten vehicles collided with pedestrians as they were travelling straight ahead, with a further three in ten colliding with pedestrians as vehicles attempted to turn left or right. Vulnerable road users experience a 75% reduction in crashes at regulated intersections than unregulated intersections (Mitani & Yamanaka, 2005, Zhao & Chen, 2016).

SUPPORTING RESEARCH AND EVIDENCE

Modelling for the State Road Safety Strategy, Towards Zero, suggests that improvements to safe roads and roadsides have the potential to reduce the KSI by 2,700 people over the life of the strategy.

The number of KSI crashes at signalised intersections has decreased by 30% per year over the life time of Towards Zero. The number of KSI crashes at non-signalised intersections has decreased by 17% per year. This has occurred as the number of intersections of all types has increased.

Treatments for intersection crashes can be found in all elements of the safe system and are outlined below in the four cornerstones of safe roads and roadsides, safe speeds, safe road user behavior and safe vehicles.

WHAT ARE THE COUNTERMEASURES?

Safe Roads and Roadsides

The risk of death or serious injury due to intersection crashes can be reduced by improvements to infrastructure, including installing well designed roundabouts (sometimes in conjunction with traffic lights), grade separation and full control right turns.

Western Australian roads were built to the standard in place at the time of their construction. Most roads are upgraded over time, but Western Australia nonetheless has inherited a series of intersections that were not built to current standards.

On average, road infrastructure investment lasts around 25 years, so safe roads and roadsides built now will continue to save lives and prevent serious injuries well into the future, especially if well targeted. In Australia it is estimated that each \$100 million spent treating high crash risk locations on the road network saves at least 20 lives, compared to about 1.5 lives for each \$100 million spent on general road improvement programs (Vulcan and Corben, 1998).

Metropolitan Intersection Crash Program

MRWA is concluding a Metropolitan Intersection Crash (MIC) program which is making targeted improvements to intersections. The MIC program is based on research which identified the risk factors for KSI intersection crashes in Perth, and then identified 60 intersections with high crash rates (Chow, 2016a; Chow, 2016b).

Appropriate countermeasures for treatment of the high-risk intersections were then identified and allocated a cost and estimated reduction in the KSI metric using the Main Roads Crash Reduction Matrix (Brameld, 2017). The suggested countermeasures include:

- Installation of roundabouts;
- Installation of traffic signals;
- Installation of red light/speed cameras;
- Improvements to signalised intersections, including mast arms;
- Removal of filter turns at signalised intersections;
- Speed reduction measures at intersections;
- Improvement to pedestrian facilities;
- Improved geometry; and
- Improved signal phasing, upgraded signal lanterns to high visibility LED.

The MIC program has been implemented across Perth for the past few years under the *Towards Zero* strategy. This is also in line with the National Road Safety Action Plan, 2018–2020 which recommends implementing safety treatments to reduce trauma from crashes at urban intersections.

Black Spot Program

Ongoing Main Roads and Local Government Black Spot programs prioritise improvements to high crash risk areas. The aim of the program is to reduce road trauma by providing a road system that is safe for all road users. Urban and regional Local Governments can apply for matched funding for infrastructure improvements, including intersection upgrades.

A 2016 metropolitan Perth Curtin-Monash Accident Research Centre (CMARC) report, studied 175,804 intersection crashes (n=7181 KSI crashes, n=168,623 non-KSI crashes) with the report looking at three types of intersection:

- 3-way intersection (T-junction);
- four or more leg intersections; and
- roundabouts (Chow et al, 2016):

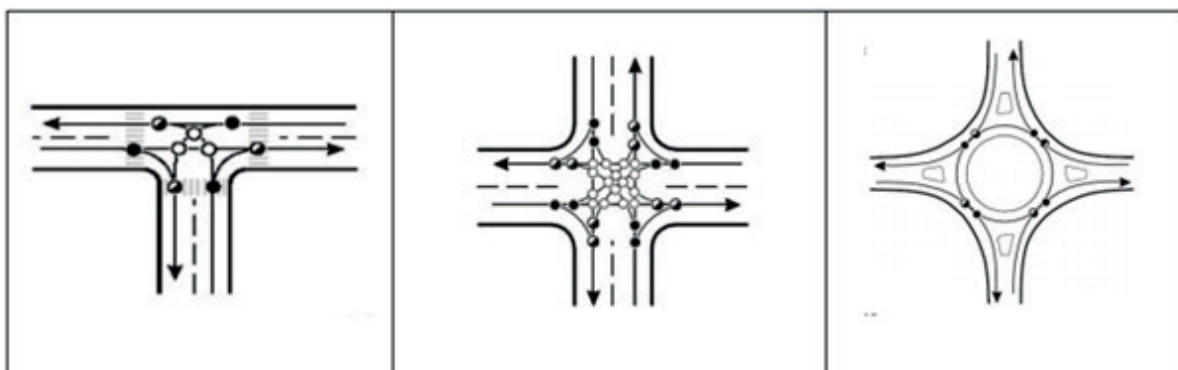


Fig 1: Three-legged (T-junction), four-legged intersection and roundabout

Regional Intersection Active Warning Systems

Regional Intersection Warning Systems (RIAWS) use electronic signs showing a variable speed limit that flash on intersection approaches when triggered by the presence of a vehicle on a side road or right turning traffic. These systems are used on regional highways, to alert drivers to the presence of vehicles turning in from side roads.

Main Roads is currently preparing for a trial of these systems in Western Australia.

Vulnerable Road Users at Intersections

The Commission's focus on vulnerable road users is facilitated through the Vulnerable Road Users Advisory Group (VRUAG). VRUAG positions the Commission to consult and engage with different types of vulnerable road users to understand their road safety concerns. As a result of the VRUAG action plan, the Commission has investigated safer ways for pedestrians, including older pedestrians and pedestrians with disabilities to cross at intersections and has commissioned research to investigate technologies to sense bicycles at intersections.

Copenhagen is about to start testing a new system of diode lights aimed at reducing the danger of bike-vehicle collisions at four particularly dangerous intersections. Blinking diodes are placed in the road surface on the final stretch towards the intersection and, when a cyclist passes a sensor, the lights start to blink and warn drivers to the fact that a cyclist is present.



Fig 2: Intelligent Sensors Copenhagen

Safe Speed

Single Vehicle and Multi-Vehicle Crashes

The survivable speed for intersections where side-on impacts between vehicles are possible is 50km/h (National Road Safety Action Plan, 2018). Reducing the speed of vehicles entering intersections was identified as a useful countermeasure in the MIC research (Brameld, 2017). Lower speed limits give the driver more reaction time to take evasive action to avoid crashes. Should a crash eventuate, lower travel speeds result in far less severe crash consequences.

The National Road Safety Strategy, 2011-2020 recommends:

- Speed limits that reflect a better balance between safety and mobility objectives
- A substantial improvement in overall compliance with speed limits
- Network-wide alignment of speed limits with inherent risk and function of the of the road and roadside environment.

Vulnerable Road Users at Intersections

The survivable speed for pedestrian-vehicle crashes is 30km/h (National Road Safety Action Plan, 2018).

Towards Zero recommends trials of lowering speed limits in areas of high pedestrian activity. In 2019 the City of Vincent began a trial of lowering the speed limits to 40km/h in a defined residential area, and other Local Governments are considering similar trials for areas with concentrations of pedestrians and cyclists. The Road Safety Commission is

providing support and an evaluation of the City of Vincent trial.

These measures are in line with the National Road Safety Action Plan, 2018-2020 which recommends reducing speed limits to 40km/h or lower in pedestrian and cyclist places.

Safe Road User Behaviour

Single Vehicle and Multi-Vehicle Crashes

In 2017, it's estimated that 77% of people killed or seriously injured were in crashes which involved a person making an error, a lapse in concentration, distraction, fatigue, judgement error or inattention. Only about 23% of people were killed or seriously injured in crashes that involved the primary risk taking behaviours of speeding, drink driving or not wearing a helmet or restraint.

Since 2005-2007, the number of people killed or seriously injured in crashes that involve primary risk taking have reduced by 48%, but only by 23% in crashes that involved mistakes, errors, distraction or poor judgement etc.

This suggests significant improvements in risk taking behaviours, but efforts to maintain and further expand this are ongoing. In particular, distraction, impaired driving and speed are relevant issues when it comes to crashes at intersections, many of which occur when one party mistakenly assumes they have right of way. Education and enforcement on these issues are ongoing and undertaken by a range of local and State agencies.

Vulnerable Road Users at Intersections

Some of these campaigns could potentially be extended to pedestrians and other vulnerable road users, particularly in distraction while crossing at intersections.

Safe Vehicles

Various forms of advanced crash avoidance technology, such as forward collision warning and blind spot monitoring, may assist in reducing intersection crashes.

The Commission is a member of the safe vehicle research and vehicle testing groups such as the Australasian New Car Assessment Program (ANCAP), the National Road Safety Partnership Program (NRSPP) and the Vehicle Safety Research Group (VSRG). Membership of these groups inform the Commission and allow the promotion of safe vehicle technologies that mitigate intersection crashes.

Forward Collision Warning

Forward collision warning systems use cameras, radar, or laser to scan the road ahead and to alert the driver if the distance to a vehicle ahead is closing too quickly. The systems alert the driver with an audible, haptic (touch), and/or visual cue.

Blind Spot Monitoring

Blind spot monitoring systems are vehicle-based sensor devices that detect other vehicles located to the driver's side and rear. Warnings can be visual, audible, vibrating, or tactile.

Intersection Collision Warning

Radar systems, or similar, detect if vehicles are approaching from the side at intersections and alert the driver of a possible collision. If it detects a collision is imminent, the vehicle applies the brakes automatically.



Fig 3: Intersection Collision Warning System

Other measures taken by vehicle manufacturers to offer added protection include:

- Electronic stability control
- Anti-lock braking systems
- Emergency brake assist
- Daytime running lights.

Crash protection technologies can also assist in reducing the severity of crashes:

- Seatbelt reminder systems
- Active head restraints
- Side and curtain air bags
- Seatbelts.

WHAT IS THE FUTURE FOCUS?

There are ongoing developments in all cornerstones of the safe system.

Local Government and Main Roads will continue to make improvements to high crash rate intersections through the Black Spot program. There is an ongoing research program to identify measures to assist pedestrians and other vulnerable road users to cross safely at intersections, and Main Roads is preparing for a trial of Regional Intersection Active Warning Systems.

Speed enforcement and community education campaigns about safer driving are ongoing, and the area of vehicle safety is rapidly developing.

Reference:

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Endorsed

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